

REMARKS

Claims 29-41 are presently in the application. Claims 1-28 and 42 have been canceled.

Claim 29 has been amended to identify the actuator as a “piezoelectric actuator” and to require that it be “operable to cause a valve opening, which is located on the valve housing opposite the conical face.” Support for the amendments is found in para. 25 of the specification.

Claims 31 and 35 have been amended to recite that the high-pressure inlet is located centrally, along the longitudinal axis of the valve housing. Support for the amendment is found in the original drawings.

Claims 29, 30, 32-34 and 39-41 have been rejected under 35 U.S.C. 102(b) as anticipated by Cerny (US 5,288,025).

Independent claim 29 is directed to a valve 1 for controlling fluids, the valve having a valve housing 10 which has an actuator chamber 11 and a laterally located inlet bore 13 that communicates with a high-pressure inlet 12, a cable outlet 17 extending from the actuator chamber 11, a piezoelectric actuator 30 with a ram 31 and an actuator cap 32 supported in the actuator chamber, and the actuator chamber 11 having a conical seal, which is embodied by means of a conical face 14 on the end of the actuator chamber and a corresponding annular sealing face 33 on the actuator cap 32, and with the conical seal the cable outlet 17 can be sealed off, the piezoelectric actuator 30 being operable to cause a valve opening, which is located on the valve housing opposite the conical face 14, the improvement wherein the actuator chamber 11 comprises at least one additional inlet bore 13, wherein the inlet bores 13 and 13 are located symmetrically around the longitudinal axis of the actuator.

Applicant's claimed invention includes a conical seal in an actuator chamber 11 and an actuator dome 32 on the piezoelectric actuator 30 to seal off the cable outlet 17 for the piezoelectric actuator. Since high pressure prevails in the actuator chamber 11, the pressure in the actuator chamber is used to press the actuator dome 32 against the sealing face 33 resulting in the sealing of the cable outlet. In order to achieve a symmetrical pressure action on the actuator dome, it is necessary to introduce the pressure forces acting on the dome in a symmetrical manner. This is accomplished in applicant's claimed invention by disposing the inlet pressure bores symmetrically around the axis of the piezoelectric actuator.

Cerny teaches a fuel injection valve having a valve element 50 and an electromagnetic actuator 76 having an armature member 110. The armature member 110 is supported above the valve element for reciprocation in bores 38, 94. The upper end portion of the valve element 50 is connected to the armature member 110 so as to move as one with the armature member. See, col. 4, ll. 56-65. The lower portion 68 of the valve element 50 is located in an annular pressure chamber 116. Four inlet bores 120 discharge into the annular pressure chamber 116 surrounding the lower portion 68 of the valve element 50. See, Fig. 5.

In applying the reference, the examiner reads the claimed "actuator" on Cerny's valve element 50, which is simply a rod or shaft. Claim 29, however, requires a piezoelectric actuator. Obviously, Cerny's valve element 50 is not a piezoelectric actuator. Thus, Cerny does not anticipate claim 29 or any claim dependent therefrom.

In addition, claim 29 requires the actuator chamber to have a conical seal, which is embodied by means of a conical face 14 on the end of the actuator chamber 11 and a

corresponding annular sealing face 33 on the actuator cap 32, and with the conical seal the cable outlet can be sealed off. Claim 29 also requires that the piezoelectric actuator be operable to cause a valve opening, which is located on the valve housing opposite the conical face.

In Cerny, the lower end portion 68 of valve element 50 is cylindrical with semi-spherically shaped end surface 70. When valve element 50 is in a closed operative position, end surface 70 seats against a conical seating surface 72 which is formed in a guide member 42. A small outlet aperture or port 74 directs fuel into combustion chamber 18 when the valve's end surface 70 is moved upwardly from seating surface 72.

Thus, Cerny can be said to be operable to cause a valve opening, but the valve opening in Cerny cannot be said to be "located on the valve housing opposite the conical face" as required by the language of claim 29. This is because the examiner reads the claimed "conical face" 14 of claim 29 on the conical seating surface 72 of Cerny. There is no other conical face disclosed in Cerny. Thus, the conical seating surface 72 of Cerny is not "opposite the conical face" as required by the claim language. For this additional reason, Cerny does not anticipate claim 29 or any claim dependent therefrom.

Still further, applicants' claim 29 requires the actuator chamber to have a conical seal, which is embodied by means of a conical face on the end of the actuator chamber and a corresponding annular sealing face on the actuator cap, and with the conical seal the cable outlet can be sealed off. The examiner is reading the "conical face on the end of the actuator chamber" on the conical seating surface 72 of Cerny and the "corresponding annular sealing face on the actuator cap" on the semi-spherically shaped end surface 70 of valve element 50. However, it

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is pointed out that the conical seating surface 72 and the semi-spherically shaped end surface 70 do not “seal the cable outlet” as required by the language of claim 29. For this additional reason, Cerny does not anticipate claim 29.

Claims 33 and 40 have been rejected under 35 U.S.C. 103(a) as being unpatentable over Cerny.

Cerny does not teach or suggest: (1) a piezoelectric actuator; (2) a piezoelectric actuator operable to cause a valve opening, located on the valve housing opposite the conical face; and (3) an actuator chamber having a conical seal, which is embodied by means of a conical face on the end of the actuator chamber and a corresponding annular sealing face on the actuator cap, and with the conical seal the cable outlet can be sealed off. Thus, Cerny is incapable of rendering claims 33 and 40 obvious.

Claims 31 and 35-38 have been rejected under 35 U.S.C. 103(a) as being unpatentable over Cerny in view of Yoshida et al (US Re. 34,527).

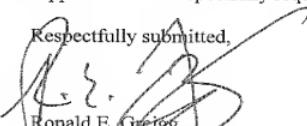
Each of claims 31 and 35-38 formerly required the high-pressure inlet to be located centrally, along the center axis of the valve housing. The examiner, at page 4 of the Final Rejection explains that since Yoshida et al's high-pressure inlet 33, 34 is along a diametrical axis and since a diametrical axis crosses the center of the valve, it can be called a central axis.

While applicants do not agree with the examiner's rationale, claims 31 and 35 have been amended to require that the high-pressure inlet be located centrally, along the longitudinal axis of the valve housing. This language clearly avoids the examiner's interpretation. Thus, withdrawal of the rejection is requested.

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Entry of the amendment and allowance of the application are respectfully requested.

Respectfully submitted,



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